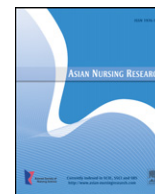


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Research Article

Effective Intervention Strategies to Improve Health Outcomes for Cardiovascular Disease Patients with Low Health Literacy Skills: A Systematic Review

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SUMMARY

Purpose: Systematic studies on the relationship between health literacy and health outcomes demonstrate that as health literacy declines, patients engage in fewer preventive health and self-care behaviors and have worse disease-related knowledge. The purpose of this study was to identify effective intervention strategies to improve health outcomes in patients with cardiovascular disease and low literacy skills.

Methods: This study employs the following criteria recommended by Khan Kunz, Keijnen, and Antes (2003) for systematic review: framing question, identifying relevant literature, assessing quality of the literature, summarizing the evidence, and interpreting the finding. A total of 235 articles were reviewed by the research team, and 9 articles met inclusion criteria. Although nine studies were reviewed for their health outcomes, only six studies, which had a positive quality grade evaluation were used to recommend effective intervention strategies.

Results: Interventions were categorized into three groups: tailored counseling, self-monitoring, and periodic reminder. The main strategies used to improve health outcomes of low literacy patients included tailored counseling, improved provider-patient interactions, organizing information by patient preference, self-care algorithms, and self-directed learning. Specific strategies included written materials tailored to appropriate reading levels, materials using plain language, emphasizing key points with large font size, and using visual items such as icons or color codes.

Conclusion: With evidence-driven strategies, health care professionals can use tailored interventions to provide better health education and counseling that meets patient needs and improves health outcomes.

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Introduction

The Institute of Medicine (IOM) defines health literacy as “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions” (IOM, 2004). In 2003, the U.S. National Assessment of Adults Literacy (NAAL) reported that more than a third of the adult population and about half of the elderly do not understand instructions on how to take medicines, do not adequately follow prescriptions, or information in pamphlets provided by health care providers (United States National Center for Education Statistics, 2006).

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Among the complex chronic diseases, cardiovascular disease (CVD) is the leading cause of morbidity and mortality in the world. In Korea, the mortality rate of CVD was 18.5% of all-cause mortality in 2009. The CVD mortality rate goes up to 847.8 per 100,000 adults over the age of 65 (Korea National Statistics Bureau, 2010). Patients with CVD require long-term care in multiple everyday life situations including at home, at work, and in the community. This ability for self-care requires understanding and utilizing health-related information, as well as informed decision-making. Therefore, those with CVD need adequate health literacy skills to improve compliance and proficiency in self-management.

The Agency for Healthcare Research and Quality (2004) highlighted the importance of health literacy in a 2004 report demonstrating the association between health literacy and health outcomes. Since then, researchers have paid close attention to interventions for patients with limited health literacy

(DeWalt et al., 2004; Gazmarian, Williams, Peel, & Baker, 2003). However, few studies have investigated the effectiveness of interventions for low health literacy. CVD patients require long-term medication therapy and significant lifestyle changes including balanced nutrition, exercise, and smoking cessation (Bosworth et al., 2008; Bryant, 2002). Therefore, health care providers should assess their patients' level of health literacy in an attempt to improve health outcomes by means of effective interventions. The purpose of this study was to identify effective intervention strategies that increase health outcomes for patients with CVD and low literacy skills. The results of the study will contribute useful information to health care providers, helping them plan effective programs comprised of evidence-based interventions and practical strategies shown to improve health outcomes.

Methods

This study followed a standard guideline for systematic review recommended by Khan, Kunz, Keijnen, and Antes (2003) including the following steps: (a) framing questions for review, (b) identifying relevant literature reflecting the research questions, (c) assessing quality of studies, (d) summarizing the evidence, and (e) interpreting the findings based on this evidence. The fifth step relates to the result of this study, hence described in the results section.

Framing questions for review

We formulated our key study question using the "Patient, Intervention, Condition and Outcomes" method, which is central to focusing searches of key terms in the literature (Richardson Wilson, Nishikawa, & Hayward, 1995). The key question in this paper was, "What are the effective intervention strategies to improve the health outcomes of patients with cardiovascular disease and low health literacy skills?" Based on this key question, we developed the following more focused questions for CVD patients with limited health literacy skills: (a) What are the effective interventions to improve health outcome? (b) What strategies among the interventions used can improve health literacy skills?

Identifying relevant literature

Selection of relevant databases

Both international and domestic databases available in Korea were used in this study. In terms of international databases, we searched Medline, the Cumulative Index to Nursing and Allied Health Literature, and the Cochrane Library. Domestic databases included KoreaMed, Korea Medical Database, Korea Education and Research Information Service, Research Information Center for Health, and Korean Studies Information.

Search terms

We conducted searches using keywords and Boolean operators from the "Patient, Intervention, Condition and Outcomes" method to enhance search efficiency. The keywords included "literacy", "numeracy", "reading skill", "reading ability", "illiteracy", "illiterate", "WRAT", "NAAL", "cardiovascular disease", "hypertension", "HTN", "high BP", "hypertensive", and "heart failure". Medical subject heading terms were not used because they do not specifically identify health literacy-related terms. Table 1 shows an example of the search strategy.

In the domestic databases, the words "health literacy" and "literacy" were searched within the Korean literature. Searches were restricted to English and Korean languages between January 1990 and August 2008. It was during the 1990s that tools for

Table 1 Search Strategy Used to Search Medline

PICO	Line	Search	No.
Patient	1	literacy.mp.	4,142
	2	numeracy.mp.	132
	3	reading skill\$.mp.	606
	4	reading ability.mp.	770
	5	literate.mp.	581
	6	illiteracy.mp.	682
	7	illiterate.mp.	854
	8	WRAT.mp.	143
	9	NAAL.mp.	15
	10	or/1–9	7,108
Condition	11	hypertension.mp.	275,687
	12	exp. hypertension/	174,574
	13	cardiovascular disease\$.mp.	92,120
	14	exp. cardiovascular disease\$.mp.	1,470,062
	15	heart failure\$.mp.	91,076
	16	high blood pressure.mp.	7,275
	17	HTN.mp.	473
	18	high BP.mp.	490
	19	hypertensive.mp	70,026
	20	or/11–25	1,562,099
Patient + Condition	21	10 and 20	254
	22	animals/	4,287,246
	23	humans/	10,480,715
	24	22 not (22 and 23)	3,227,844
	25	21 not 24	254
	26	limit 25 to (English or Korean)	230
	27	limit 26 to yr="1990–2008"	210

Notes. PICO = Patient, Intervention, Condition and Outcomes; WRAT = Wide Range Achievement Test; NAAL = National Assessment of Adults Literacy.

developing health literacy skills began to emerge; therefore, we focused our research on this time period. Additionally, using the references listed in studies, we performed additional searches using our electronic databases, and citation tracking of key papers was conducted to search for further relevant studies. Search strategies applied to the Medline database are shown in Table 1.

Selection criteria

The National Health and Medical Research Council (2000) recommends randomized controlled trial (RCT), cohort studies, and patient-control group studies as appropriate study designs for systematic reviews. Thus, we limited our previously discussed searches to RCTs and patient-control group studies to evaluate strategies for intervention and outcome.

The inclusion criteria were as follows: (a) studies on CVD patients whose health literacy had been measured directly, or whose literacy skills were reported as being "low", (b) intervention studies including experimental studies and observational studies, (c) studies published in English and Korean, and (d) studies with reported intervention strategies to improve health outcomes. Studies with any of the following criteria were excluded: (a) studies including nonadult patients, and (b) studies with only published abstracts, (c) studies that were not original articles (e.g., editorials, opinion pieces, reviews, and notes).

Results of literature search

Our search of the databases listed above resulted in 295 abstracts (290 international studies and 5 Korean studies), which after discounting duplicates, resulted in 235 studies overall. We reviewed the abstracts of these 235 studies to determine whether they met our study's inclusion criteria. As seen in the flowchart of the study selection process in Figure 1, 25 abstracts met the initial inclusion criteria, resulting in 210 exclusions. Full texts of the 25 abstracts were obtained, and two researchers independently assessed these studies for further evaluation of eligibility for our

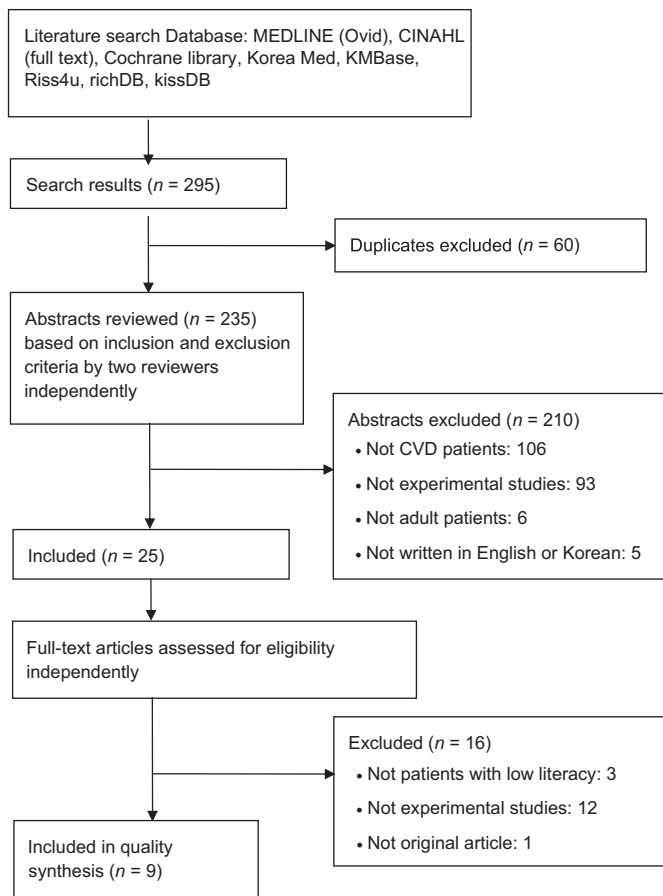


Figure 1. Flow of study selection. Note. CVD = cardiovascular disease.

study. The selection was narrowed down to a total of nine studies. No relevant Korean studies met our inclusion criteria.

Assessing literature quality

In a nonblinded fashion, two reviewers independently assessed the quality of the nine resulting studies. This was done using a methodology checklist developed by the [Scottish Intercollegiate Guidelines Network \(2008\)](#), which was translated into Korean by the Korean Health Insurance Review and Assessment Services with only slight modifications. The checklist consists of nine criteria: (a) appropriate research question, (b) randomization including blinding of treatment allocation, (c) concealment method, (d) similarity between control group and treatment group, (e) description of the intervention, (f) relevant outcomes measurement, (g) dropout rate, (h) intention to treat analysis, and (i) confidence of multi-site studies. Based on these criteria, we rated the overall quality of the nine studies using three grades: (–), (+), (++). The grade (–) meant few or no criteria were fulfilled; therefore, the conclusions of the study were likely or very likely to be unsubstantiated. The grade (+) meant some of the criteria might have been fulfilled, and thus, the conclusions were unlikely to be biased; and finally, the grade (++) meant all or most of the criteria had been fulfilled and the conclusion of the study was definitely not biased. Among the nine studies, six had a quality grade of (+), three were (–), and no studies were (++). The health outcomes of all nine studies were analyzed. However, only six studies with (+) grades in quality evaluation were used for analysis of effective intervention strategies; this was to ensure the scientific rigor of our research methods.

Summarizing the evidence

After determining the studies to be included, two researchers were paired up to review the full text of all nine studies. Research team members entered data and developed evidence tables. Outcomes were classified according to three variables: knowledge, attitudes, and behaviors. Pairs of researchers once again reviewed article summaries and gathered data on which they reached an agreement. Finally, the outcomes and content of the data was reconciled by another researcher.

Results

Characteristics of included studies

Of the nine studies, seven were RCTs, one was a nonrandomized controlled trial, and one was a “before-and-after” study. [Table 2](#) summarizes the characteristics and primary outcomes of the final studies in our review. The key health topics investigated in each study included heart failure ($n = 4$), hypertension ($n = 3$), and hypercholesterolemia ($n = 2$).

The sample size of these studies ranged from 25 to 636. The duration of interventions lasted for at least 6 months, the exception being one study with an intervention period of less than 3 months ([DeWalt et al., 2004](#)). All of the studies were conducted in the US, in either community or outpatient settings. Regarding the general characteristics of participants, ages ranged from 30 to 80 years old. Seven studies included participants with a mean age over 60 years. The percentage of female participants ranged from 35–74% among the nine studies. Additionally, 18–75% of participants had reportedly “low income” although this term did not have a uniform definition across studies.

In terms of health literacy measurements, six studies used direct tools including health literacy instruments; two studies did not measure health literacy directly, but made assumptions about health literacy skills based on sociodemographic status ([Ammerman et al., 1992](#); [Echeverry et al., 2005](#)). In two studies, the Rapid Estimate Adults Literacy in Medicine ([Davis et al., 1993](#)) was used ([Bosworth et al., 2005](#); [Bosworth et al., 2008](#)). Three studies ([DeWalt et al., 2006](#); [Morrow, Weiner, Steinley, Young, & Murray, 2007](#); [Murray et al., 2007](#)) used the Short Test of Functional Health Literacy in Adults ([Baker, Williams, Parker, Gazmararian, & Nurss, 1999](#)). One study ([DeWalt et al., 2004](#)) used both the Rapid Estimate Adults Literacy in Medicine and the Test of Functional Health Literacy in Adults. Seven studies reported percentages of low health literacy groups to range from 27% to 100%.

Categories of interventions and health outcomes

Among the nine studies, interventions were categorized according to three main characteristics: (a) tailored counseling, (b) education with self-monitoring, and (c) periodic reminders. Health outcomes were divided into four groups: (a) knowledge including specific disease-related knowledge and understanding of physician instruction, (b) psychological outcomes including improved self-efficacy, self-confidence, and quality of life, (c) self-management behavior, and (d) physiological factors. The results are shown in [Table 3](#).

Effects of tailored counseling and health outcomes

In this study, “tailored counseling programs” refer to interventions in which individuals or small groups share and discuss their experiences. This intervention is in contrast to passively receiving lectures as a group. A total of six studies used the tailored

Table 2 General Characteristics of Included Studies

Author, year	Design (sample size)	Related disease/ settings	Subjects (intervention group)			Intervention		Control	Primary outcomes
			Group (N)/Female (%) /Low income (%)	Mean age	Literacy tools/ illiteracy (%)	Frequency of interval/ Duration	Contents		
Tailored counseling									
Ammerman et al. (1992)	NRCT (249)	Hypercholestremia/ outpatient	210/— ^a /— ^a	— ^a	None (— ^a)	— ^a /8 months	Nutrition education for CVD prevention using Dietary Risk Assessment	Not reported	Attitude changes of patients & doctors
Bosworth et al. (2005)	RCT (588)	HTN/outpatient	294/67/23	63	REALM (— ^a)	Every 2 months/ 12 months	Telephone intervention based on modules	Usual care	Knowledge, confidence, medication adherence
Bosworth et al. (2008)	RCT (636)	HTN/outpatient	319/61/18	61	REALM (27)	Every 2 months/ 24 months	Telephone intervention based on modules	Usual care	Medication adherence
Kumanyika et al. (1999)	RCT (330)	Hypercholestremia HTN/community	167/74/53.9	— ^a	Word recognition (48.5)	Every 4 months/ 12 months	Nutrition education using CARDES materials (full instruction)	Partial instruction using CAREDS	Physiological factor (T. cholesterol, BP)
Morrow et al. (2007)	RCT (236)	CHF/outpatient	83/71/— ^a	63.5	s-TOFHLA (— ^a)	— ^a /6 months	Pharmacist-based education using patient-centered materials	Usual care	Preference on medication information
Murray et al. (2007)	RCT (314)	CHF/outpatient	122/68/46.8	61.4	s-TOFHLA (28)	Every 2 months/ 12 months	Pharmacist-based education using protocol	Usual care	Medication adherence (taking, refill), hospital admission
Self-monitoring									
DeWalt et al. (2004)	Before-&-after study (25)	CHF/outpatient	25/40/75	60	REALM (100) s-TOFHLA (52)	8 session/3 months	Self-adjustment of diuretics based on weight fluctuation	Usual care	
DeWalt et al. (2006)	RCT (123)	CHF/outpatient	59/42/67—69	63	s-TOFHLA (42)	11 sessions per 6 months/ 12 months	Self-adjustment of diuretics based on weight fluctuation	Usual care	Hospitalization or death, QoL
Periodic reminder									
Echeverry et al. (2005)	RCT (160)	HTN, DM, angina, MI/community	78/35/— ^a	67.4	— ^a (— ^a)	Every month/ 6 months	Follow-up program using reminder card & brochure	Not reported	Physiological factor (BP, HbA _{1c})

Notes. NRCT = nonrandomized controlled trial; RCT = randomized controlled trial; HTN = hypertension; CHF = congestive heart failure; DM = diabetes mellitus; MI = myocardial infarction; REALM = Rapid Estimate Adults Literacy in Medicine; s-TOFHLA = Short Test of Health Literacy in Adults; CVD = cardiovascular disease; CARDES = cardiovascular dietary education system; QoL = quality of life; BP = blood pressure; —^a = not reported.

Table 3 Intervention Strategies and Health Outcomes by Interventions

Study	Intervention		Outcomes				Quality
	Materials characteristics/readability level	Main/specific strategies	Knowledge	Attitude	Self-management behaviors	Others	
Tailored counseling							
Ammerman et al. (1992)/NRCT	Pamphlet Tip sheet Cook book	5–6th Tailored advice using dietary risk assessment based on individual's eating habits & regional patterns (Regional terminology, realistic food illustrations, adaptations of existing southern diet rather than a radical transformation of eating pattern, stop sign symbols used to flag food)	Understands physician instruction ^a	Confidence about changing diet	Discussing dietary issue ^a	Diet satisfaction from doctor ^a	–
Kumanyika et al. (1999)/RCT	Food cards Video Nutritional guide Audiotape series	5–8th Self-directed, self-paced learning within the on text of the person's social network (full colored food cards, materials were culturally relevant & familiar to African American, video & audio for self-learning in the person's home, symbols use to an average serving of the level of fat, cholesterol & sodium)				Total cholesterol, ^a LDL, ^a BP ^a decreased; HDL increased.	+
Bosworth et al. (2005)/RCT		Tailored information & feedback based on 9 modules by telephone, patient & provider interaction (tailored algorithm module by health decision, combined influences of health beliefs & modifying factors, cue strategies: NHLBI (tips to help you remember to take your BP drugs)	Perceived risk/knowledge	Self-confidence ^a increased ($p < .007$)	Medication adherence (self)		+
Bosworth et al. (2008)/RCT	Pictorial handouts	8th Tailored information & feedback based on 11 modules by telephone, patient & provider interaction (pictorial handbook, plain language, avoided medical jargon, tailored algorithm module by health decision & combines the influences of health beliefs & modifying factors, various mnemonic strategies)	Medication adherence (self) ^a				+
Morrow et al. (2007)/RCT		7th Patient-centered instruction using schema, icon & timeline (patient-centered instruction format using schema, icon & timeline, large font point type)				Preference	+
Murray et al. (2007)/RCT	Patient-centered instruction	7th Organization of the document & readers' knowledge & goals, communication technique for low literacy patient (large font type, patient-centered instruction format using schema, icon & timeline)		QoL, Patient satisfaction ^a increased.	Medication adherence ^a (Taking, refilling, scheduling) increased.	Cost, ^a emergency visit & admission, ^a adverse medication events	+
Self-monitoring							
DeWalt et al. (2004)/before- & after study	Booklet	3rd Self-control algorithm, interactive communication loop (clear picture-based education booklet, simple language, small number of teaching points rather than general knowledge, patient-provider interactive communication, teaching goals around key self-care skill building, particularly symptoms, weight assessment development, & applied self adjustment of diuretics algorithm)	CHF knowledge	Self-efficacy ^a increased	Daily weight measurement ^a	QoL ^a increased	–
DeWalt et al. (2006)/RCT	Booklet	6th Self-control algorithm, interactive communication loop (clear, picture-based education booklet, simple language, small no. of teaching points rather than general knowledge, patient-provider interactive communication, teaching goals around key self-care skill building, particularly symptoms, weight assessment development & applied self-adjustment of diuretics algorithm)	CHF knowledge ^a increased	Self-efficacy ^a increased	Daily weight measurement ^a	QoL	+
Reminder							
Echeverry et al. (2005)/RCT	Brochure, Reminder cards				Medication adherence	BP, HgA ₁ C	–

Notes. NRCT = nonrandomized controlled trial; RCT = randomized controlled trial; NHLBI = National Health, Lung, and Blood Institute; LDL = low-density lipoprotein; BP = blood pressure; HDL = high-density lipoprotein; QoL = quality of life; CHF = congestive heart failure.

^a Indicates significant results.

counseling program. Two RCTs reported significant attitude changes with this intervention (Bosworth et al., 2005; Murray et al., 2007). Bosworth et al. (2005) found that self-confidence with hypertension management increased by 0.33 points above baseline at 6-month follow-up ($p < .007$). Murray et al. found that quality of life among heart failure patients was unchanged from baseline at 6-month and 12-month follow-ups; however, patient satisfaction was greater in the intervention group compared with that of the control group (1.0 vs. 0.7; $p = .022$). Additionally, two RCTs addressed the effects of change in self-management behaviors (Bosworth et al., 2008; Murray et al.). Bosworth et al. (2008) found that self-rated medication adherence and satisfaction increased by 9% in the intervention group at 12-month post-intervention period compared to that of the control group. Murray et al. reported that among the intervention group at 12-month follow-up, there was a 10.9% increase in medication adherence (95% CI: 5.0–16.7), 5.9% increase in scheduling (95% CI: 0.4–11.5), and 4.2% increase in refills ($p = .007$). One study reported decreased annual direct health care costs among the intervention group. Kumanyika et al. (1999) revealed that total cholesterol, low-density lipoprotein cholesterol, and blood pressure decreased in both intervention and control group after 12 months ($p < .001$). HDL-cholesterol was found to be increased among the intervention group in this study ($p < .001$). Murray et al. found that in the intervention group, emergency department visits and hospital admissions were decreased by 19.4% with an incidence rate ratio of 0.82 (95% CI 0.73–0.93) and annual direct health care costs were lowered by US\$2,960.00 (95% CI: \$7,603–\$1,338).

Education with self-monitoring and health outcomes

“Self-monitoring interventions” refer to those that relate to the individual monitoring of one’s health primarily at home. Self-monitoring is defined as the process of implementing, recording, and evaluating specific health behaviors for oneself.

Only one RCT reported that knowledge of Congestive Heart Disease increased by 12% (95% CI: 6–18; $p < 0.001$) following a 1-hour session with health educator during a regular clinical visit in 12 months (DeWalt et al., 2006). The RCT study that received a (+) quality grade examined changes in attitude and self-management behavior. This study found that self-efficacy improved in the intervention group, with a 2-point mean difference in improvement (95% CI: 0.7–3.1; $p = .0026$). Measurements of daily weight were also significantly higher in the intervention group compared with that of the control group at 12-month follow-up (79% vs. 29%; $p < .001$; DeWalt et al.).

Periodic reminders and health outcomes

A “periodic reminder intervention” refers to services that aim to offer continuous encouragement and reminders, including periodic mailing of information after teaching sessions so that patients follow through with planned health behaviors. Only one RCT used the periodic reminder intervention, but received a grade of (–) in quality. Echeverry et al. (2005) found no significant change in blood pressure and HbA_{1c} in this intervention group; however, medication adherence for preventing complications was increased in the control group ($p < .001$).

Strategies to improve health literacy skills

We investigated main strategies for improving health literacy skills among CVD patients with low literacy skills by systematically reviewing the following studies included in Table 3. Bosworth et al. (2005) used the patient reminder approach. Morrow et al. (2007)

and Murray et al. (2007) utilized organizing information by patient preference. DeWalt et al. (2006) applied self-care algorithms. Kumanyika et al. (1999) used self-directed learning. Lastly, Bosworth et al. (2005), Bosworth et al. (2008), DeWalt et al. (2004), and DeWalt et al. (2006) utilized provider-patient interactions.

Tailored counseling

Bosworth et al. (2005) applied a tailored counseling approach that considered sociopsychological factors that affect management of hypertension including patient factors, provider factors, health environment factors, and sociocultural factors. This study developed nine medication adherence teaching modules tailored to potentially controllable factors such as hypertension-related knowledge, patient-provider communication, memory, literacy skills, medication side effects, social support, and missed appointments. These modules were presented over the telephone after each participant was assessed. The results demonstrated a significant increase in self-confidence ($p < .007$), but no change in knowledge and medication adherence. Later, Bosworth et al. (2008) added lifestyle-related counseling such as daily weight management, nutrition, stress management, smoking, and alcohol consumption and developed two additional modules to the existing nine, which resulted in increased medication adherence.

Organizing information by patient preference

Morrow et al. (2007) and Murray et al. (2007) found increased medication adherence after applying newly developed directions for medication use. Morrow et al. surmised that cognitive ability affected health literacy skills, and patient preferences for levels or types of information differed based on health literacy skills. For example, participants with low health literacy skills preferred information on how to take prescribed dosages at scheduled times rather than information about medication interactions and side effects. Thus, Morrow et al. emphasized that prioritizing practical information on how to take medication based on patient preference would be a main strategy to increase medication adherence.

Providing self-care algorithms

Two studies applied self-care algorithms, and stated that the main strategies for participants with low literacy would be to provide basic algorithms rather than facilitate autonomous decision-making to choose certain behaviors (DeWalt et al., 2004; DeWalt et al., 2006). DeWalt et al. (2004) developed medication administration algorithms based on a person’s self-measured weight and applied this algorithm to study participants. With this algorithm, even participants with poor mathematical skills and reading comprehension were able to decide for themselves their medication dosages. The simple activity of measuring one’s own weight was associated with increased medication adherence.

Self-directed learning strategies

Kumanyika et al. (1999) emphasized socio-environmental self-directed learning strategies. In their study, African-American female participants were provided case examples of African American females changing their lifestyles. Then, preventative measures for CVD were discussed in small groups focusing on problem-solving discussion. Audiotapes on nutritional education were given to participants who were encouraged to listen to the tapes repeatedly at home. The results revealed that as the frequency of using education materials increased, and serum cholesterol and blood pressure decreased among participants.

Provider-patient interaction strategies

Five studies used supplemental strategies of improved provider-patient interactions. DeWalt et al. (2006) used a pedagogic strategy called an “interactive communication loop” for patient counseling. This strategy is also called the “teaching back” method aimed at verifying what patients remembered and understood during counseling. Equipped with these new tools, patients practiced new skills and recorded the results every day. One example was to ask patients to learn how to measure their weights at home and to record the results. Bosworth et al. (2005) and Bosworth et al. (2008) were interested in doctor-patient interactions and included “participatory decision-making,” which focused on opinions and questions in interventions. Murray et al. (2007) developed a program about communication skills for multidisciplinary team members who needed to learn effective communication skills with each other and with patients. These communication strategies increased self-confidence among participants leading to better control of their own health behaviors. In other words, these actions resulted in improved self-efficacy (Bosworth et al., 2005) and increased medication adherence (Bosworth et al., 2008; Murray et al.).

Specific health literacy strategies included concrete activity strategies aimed at improving health outcomes among those with limited health literacy. Primary strategies refer to the direction for complete interventions. The specific strategies used are summarized in Table 3. First, the reading level of health education materials was modified to meet the needs of patients with low health literacy. Seven studies directly measured the reading comprehension level of participants. The methods for measuring reading comprehension varied: six studies used the Fry Formula (Fry, 1968) or Flesch-Kincaid Formula (Flesch, 1948), which considers participants with less than 6 years of education as having low health literacy. Second, visual materials, in addition to simple language and adjusted font size were found to be effective. For example, Murray et al. (2007) modified written medication instructions so that the text font size was larger (from 8 to 10 points), and titles were larger (up to 18 points). Also, the number of words was decreased from 588 to 151. Third, a “Scheme instruction method” was used to improve patient memory. This method creates imaged icons of medications using well-known schemas and recognizable symbols in medication directions on bottle caps. For example, the “Red Ace” is used for participants with heart medications, and a timeline icon is marked on the medication bottles to help participants distinguish one bottle of medication from another. These methods resulted in increased medication adherence.

Discussion

This study attempted to identify effective strategies to improve health outcomes for patients with CVD and low health literacy skills through a systematic review. In this study, seven RCTs, one non-RCT, and one before-and-after study were analyzed. Many studies identified low health literacy groups as elderly, female, and individuals with low annual income. This is a similar finding to the IOM study (2004) that identified elderly patients, immigrants, minorities, and low-income groups as having low health literacy skills. Among the interventions used to improve health outcomes of CVD patients with low health literacy, a tailored counseling approach was found to be most effective as demonstrated by five RCTs. The tailored individual approach is an intervention strategy that has several beneficial outcomes. Our finding is similar to that of Pignone, DeWalt, Sheridan, Berkman, & Lohr (2005), where 9 out of the 20 health literacy-related intervention studies demonstrated effectiveness with tailored counseling. The Agency for Healthcare Research and Quality (2004) pointed out that individuals with

limited health literacy are at risk for negative psychological effects—people with low health literacy skills tend to feel ashamed of their low reading and vocabulary abilities and hide these presumed flaws (Parikh, Nurss, Baker, & Williams, 1996). Therefore, a tailored individual approach may be more effective than a group-approach for people with low health literacy skills.

Provider-patient interaction was also found to be an effective strategy to improve health literacy skills. DeWalt et al. (2004) reported the importance of definitive information delivery using an interactive communication loop, which was suggested by Schillinger et al. (2003). This study demonstrated improved blood glucose control among diabetic patients with the use of appropriate teaching back strategies. Using a teaching back method, health care professionals can engage in interactive communication that checks a patient's errors or misunderstandings. Also, this strategy allows patients with low health literacy to share their health beliefs via open communication. According to Wolf et al. (2007), 86.5% of patients do not express that they do not understand the direction and written guidelines given by health care providers. Therefore, health care providers need to understand how patients express their health beliefs and communicate their understanding. The majority of the reviewed studies provided educational materials based on participant literacy level, and two of these studies accommodated information according to patient preferences. This is similar to the study of Pignone et al. (2005), which identified that educational materials below elementary level were effective for improving the understanding of health information. According to Yu and Cho (2005), participants also wanted to learn specific behaviors and skills more so than general information; therefore, health care providers should provide specific guidelines and methods to achieve health goals.

As we reviewed above, educational interventions have been commonly used as strategies to improve health outcomes of patients with low health literacy (Schaefer, 2008). The main types of intervention reviewed in this study included tailored counseling, self-monitoring, and periodic reminder. These are internationally well-known interventions for CVD management. Consistent with our results, the Cochrane review by Glynn, Murphy, Smith, Schroeder, and Fahey (2010) recommended self-monitoring, appointment reminders, and educational interventions as effective strategies for hypertension. Most interventions utilized in hypertensive patients in Korea focused on exercise, nutrition, and medication compliance through various educational methods to enhance abilities to self-manage chronic disease (Kim & Song, 2008).

This study is limited in the following ways. First, despite different definitions of CVD, the results of our search included CVD such as hypertension, hypercholesterolemia, and heart failure. Medline has medical subject headings terms for CVD; however, many relevant studies have used specific diagnoses instead of the more general term “cardiovascular disease.” For that reason, the measured health outcomes of each study were different from one another, making it difficult to draw conclusions from the review. Further studies are needed to investigate focused disease topics.

Second, health literacy research is in the early stages of adopting RCTs; therefore, we were not able to include many scientifically rigorous studies in our review. The National Health and Medical Research Council (2000) recommends RCTs, cohort studies, and patient-control group studies as appropriate study designs for systematic review. Speros (2005) noted that there was very little research on health literacy. Additionally, recently published systematic reviews in this field included research studies of uncontrolled experimental design (Pignone et al., 2005) and cross-sectional studies (Loke, Hinz, Wang, & Salter, 2012). According to a recent systematic review on health literacy in CVD/diabetes, Loke et al. analyzed only 7 studies out of 1,310 studies. Robust

systematic reviews differ from traditional literature reviews. A systematic review summarizes results using scientific methodology thereby providing firm evidence of clinical effectiveness (Khan et al., 2003). However, the small number of studies reviewed in this study may limit the generalizability of our findings and further diminish its potential contribution to clinical practice (Amin, Hajeri, Civelek, Fedrowicz, & Manzer, 2010). On the other hand, the result of permitting a large number of studies in a review without proper appraisal of their relevancy and quality, may provide inadequate evidence that misguides future strategies and policies. We must be able to understand the processes and pitfalls of systematically reviewing the literature and discriminate between robust and flawed reviews (Khan et al.).

Third, because of our lack of translation capabilities, we excluded five non-English studies from the analysis. Also the majority of studies that were reviewed were US based. The absence of specific participants within the study population of the included articles might limit the generalizability and external validity of our systematic review (Amin et al., 2010). Since the concept of health literacy is understood within a cultural context (Lee, Kang, & Kim, 2009), the results may be only relevant to the U.S. population. Future research should include a broad but representative section of patients from the population of interest. Future studies should aim to minimize the effects of selection bias, so that findings can apply to a wider population.

Future studies should consider the following key points in improving outcomes in CVD patients with low health literacy skills. First, studies are needed to identify appropriate education materials for people with low health literacy skills. In this study, we were unable to identify appropriate education materials for people with low health literacy. In the study by Pignone et al. (2005), interventions including computer programs, CD-ROMs, and interactive videodiscs were used for patients with diabetes and depression. However, the quality of the study methodology was unsatisfactory and no consistent results were found. Generally, visual and auditory materials are known to be effective for people with low health literacy. Written materials allow people to pace their reading and understanding of the materials (Shieh & Hosei, 2008). Therefore, further study is needed to investigate the types of educational materials that would be effective for people with limited health literacy. Second, an objective criterion, including reading level, is needed to evaluate the appropriateness of materials in any intervention. Paintings, pictures and icons that were used as education materials in studies were analyzed and reported as effective, but the evaluation was only based on reading comprehension using texts and no information was given on the suitability of education materials. Therefore, a comprehensive evaluation, including contents, graphics, literacy and typography, cultural appropriateness, and reading comprehension are needed in the future.

Conclusion

In conclusion, although we identified some evidence of effective intervention strategies, including tailored counseling which was supported by 5 RCTs, reliable and conclusive evidence is still lacking as to what intervention strategy best increases health outcomes for patients with CVD and limited health literacy skills. Future research should focus on well-designed RCTs and high quality studies with more objective assessments of health literacy related outcomes and more focused investigations of specific diseases.

Conflict of interest

All authors in this manuscript (Tae Wha Lee, Soo Jin Kang, Sun Hee Lee, Hye Hyun Kim) declare that there is no actual conflict of

interest including any financial, personal or other relationships with other people or organizations with three years of beginning the submitted work that could inappropriately influence, or be perceived to influence, their work.

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References

- Agency for Healthcare Research and Quality. (2004). *Literacy and health outcomes*. (AHRQ No. 04-E007-2). Research Triangle Institute International-University of North Carolina Evidence Based Practice Center. Retrieved August 1, 2011, from <http://www.ahrq.gov>
- Amin, F., Hajeri, A. A., Civelek, B., Fedorowicz, Z., & Manzer, B. M. (2010). Enhanced external counterpulsation for chronic angina pectoris. *Cochrane Database of Systematic Reviews*, 2, CD007219.
- Ammerman, A. S., DeVellis, B. M., Haines, P. S., Keyserling, T. C., Carey, T. S., DeVellis, R. F., et al. (1992). Nutrition education for cardiovascular disease prevention among low income populations description and pilot evaluation of a physician-based model. *Patient Education and Counseling*, 19, 5–18.
- Baker, D. W., Williams, M. V., Parker, R. M., Gazmararian, J. A., & Nurss, J. (1999). Development of a brief test to measure functional health literacy. *Patient Education and Counseling*, 38, 33–42.
- Bosworth, H. B., Olsen, M. K., Gentry, P., Orr, M., Dudley, T., McCant, F., et al. (2005). Nurse administered telephone intervention for blood pressure control: a patient-tailored multifactorial intervention. *Patient Education and Counseling*, 57, 5–14.
- Bosworth, H. B., Olsen, M. K., Neary, A., Orr, M., Grubber, J., Svetkey, L., et al. (2008). Take control of your blood pressure study: a multifactorial tailored behavioral and educational intervention for achieving blood pressure control. *Patient Education and Counseling*, 70, 338–347.
- Bryant, P. K. (2002). Congestive heart failure performance project. *Lippincott's Case Management*, 7, 152–162.
- Davis, T. C., Long, S. W., Jackson, R. H., Mayeaux, E. J., George, R. B., Murphy, P. W., et al. (1993). Rapid estimate of adult literacy in medicine: a shortened screening instrument. *Family Medicine*, 25, 391–395.
- DeWalt, D. A., Malone, R. M., Bryant, M. E., Kosnar, M. C., Corr, R. E., Rothman, R. L., et al. (2006). A heart failure self-management program for patients of all literacy levels: a randomized controlled trial. *BMC Health Services Research*, 6, 30.
- DeWalt, D. A., Pignone, M., Malone, R., Rawls, C., Kosnar, M. C., George, G., et al. (2004). Development and pilot testing of a disease management program for low literacy patients with heart failure. *Patient Education and Counseling*, 55, 78–86.
- Echeverry, D., Dike, M., Jovanovic, L., Wollitzer, A. O., Westphal, S., Mudaliar, S., et al. (2005). Efforts to improve subsequent treatment of cardiovascular risk factors in older patients with diabetes hospitalized for a cardiac event. *American Journal of Managed Care*, 11, 758–764.
- Flesch, R. (1948). A new readability yardstick. *Journal of Applied Psychology*, 32, 221–233.
- Fry, E. (1968). A readability formula that saves time. *Journal of Reading*, 11, 513–578.
- Gazmarian, J. A., Williams, M., Peel, J., & Baker, D. W. (2003). Health literacy and knowledge of chronic disease. *Patient Education and Counseling*, 51, 267–275.
- Glynn, L. G., Murphy, A. W., Smith, S. M., Schroeder, K., & Fahey, T. (2010). Interventions used to improve control of blood pressure in patients with hypertension. *Cochrane Database of Systematic Reviews*, 2, CD005182.
- Institute of Medicine. (2004). *Health literacy: a prescription to end confusion*. Washington, DC: National Academies Press.
- Khan, K. S., Kunz, R., Keijnen, J., & Antes, G. (2003). *Systematic reviews to support evidence-based medicine: How to review and apply findings of healthcare research*. London: The Royal Society of Medicine Press.
- Kim, S., & Song, M. S. (2008). Comparison of non-pharmacological intervention programs for the aged with hypertension in Korea and other countries. *Journal of Korean Gerontological Nursing*, 10, 162–163.
- Korea National Statistics Bureau. (2010). *Cause of death statistics for 2007*. Retrieved August 1, 2010 from <http://www.nso.go.kr>
- Kumanyika, S. K., Adams-Campbell, L., Van Horn, B., Ten Have, T. R., Treu, J. A., et al. (1999). Outcomes of a cardiovascular nutrition counseling program in African-Americans with elevated blood pressure or cholesterol level. *Journal of the American Dietetic Association*, 99, 1380–1391.
- Lee, T. W., Kang, S. J., & Kim, H. H. (2009). *Effects of motivational interviewing for low literacy elderly with hypertension in the community: randomized control trial*. Washington, D.C: Poster session presented at the Health Literacy Annual Conference.

- Loke, Y. K., Hinz, I., Wang, X., & Salter, C. (2012). Systematic review of consistency between adherence to cardiovascular or diabetes medication and health literacy. *The Annals of Pharmacotherapy*, 46, 863–872.
- Morrow, D. G., Weiner, M., Steinley, D., Young, J., & Murray, M. D. (2007). Patients' health literacy and experience with instructions: influence preferences for heart failure medication instructions. *Journal of Aging and Health*, 19, 575–593.
- Murray, M. D., Young, J., Hoke, S., Tu, W., Weiner, M., Morrow, D., et al. (2007). Pharmacist intervention to improve medicine adherence in heart failure. *Annals of Internal Medicine*, 146, 714–725.
- National Health and Medical Research Council. (2000). *How to review the evidence: systematic identification and review of the scientific literature*. Canberra, Australia: Author.
- Parikh, N. S., Nurss, J. R., Baker, D. W., & Williams, M. V. (1996). Shame and health literacy: the unspoken connection. *Patient Education and Counseling*, 27, 33–39.
- Pignone, M., DeWalt, D. A., Sheridan, S., Berkman, N., & Lohr, K. N. (2005). Interventions to improve health outcomes for patients with low literacy: a systematic review. *Journal of Internal Medicine*, 20, 185–192.
- Richardson, W., Wilson, M. C., Nishikawa, J., & Hayward, R. S. A. (1995). The well-built clinical question: a key to evidence based decisions. *American College of Physicians Journal Club*, 123(3), A12–A13.
- Schaefer, C. T. (2008). Integrated review of health literacy interventions. *Orthopedic Nursing*, 27, 302–316.
- Schillinger, D., Piette, J., Grumbach, K., Wang, F., Wilson, C., Daher, C., et al. (2003). Closing the loop: Physician communication with diabetic patients who have low literacy. *Archives of Internal Medicine*, 163, 83–90.
- Scottish Intercollegiate Guidelines Network. (2008). *Sign 50: A guideline developer's handbook*. Retrieved August 1, 2008, from <http://www.sign.ac.uk>
- Shieh, C., & Hosei, B. (2008). Printed health information materials: evaluation of readability and suitability. *Journal of Community Health Nurse*, 25(2), 73–90.
- Speros, C. (2005). Health literacy: concept analysis. *Journal of Advanced Nursing*, 50, 633–640.
- United States National Center for Education Statistics. (2006). Adult literacy in America: a first look at the findings of the National Adult Literacy Survey (NCES publication No. 1993-275). Washington, D.C.: Author.
- Wolf, M. S., Williams, M. V., Parker, R. M., Parikh, N. S., Nowlan, A. W., & Baker, D. W. (2007). Patients' shame and attitudes toward discussing the results of literacy screening. *Journal of Health Communication*, 12, 721–732.
- Yu, J. O., & Cho, Y. B. (2005). The effect of an internet community on knowledge, self efficacy and self care behavior in workers with hypertension. *Journal of Korean Academy Nursing*, 35, 1258–1267.